

REMARKS

This Amendment is filed in response to the final Office action mailed on January 27, 2005. All objections and rejections are respectfully traversed. Reconsideration of the application is respectfully requested.

Claims 1-58 are pending.

No claims have been amended.

No new claims have been added.

At paragraph 2 of the Office action, claims 1-59 were restricted into two groups: claims 1-58 (system and method) and claim 59 (electromagnetic signal). The examiner withdrew claim 59 from consideration as being directed to a non-elected invention since claims 1-58 were constructively elected by original presentation.

The Applicants hereby traverse the restriction, and submit that claim 59 contains the same or similar subject matter as independent claims 30, 43, 44, 45 and 58. In particular, claim 59 contains substantially the same method steps recited in independent claim 30. Accordingly, examination of claim 59 would not necessitate further searching by the examiner.

At paragraph 3 of the Office action, claims 1-10, 17-19, 24-27, 30-42 and 45-58 were rejected under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 6,158,017 issued on December 5, 2000 to Han et al. (hereinafter "Han").

The present invention, as set forth in representative claim 1 comprises in part:

1. (Original) A system adapted to correct multiple storage device failures in a storage array using a combination of multiple first parity groups and a single secondary parity group, the system comprising:

a storage array having a plurality of concatenated sub-arrays, each sub-array including a set of data storage devices and a first parity storage device, the array further including a global secondary storage device associated with the storage array and holding secondary parity values for the single secondary parity group, the secondary parity values computed across the concatenation of the sub-arrays.

Han discloses two different parity arrangements, DH and DH2. Both parity arrangements utilize a single disk array having diagonal parity (D) striped across multiple storage disks in the array. See col. 3, lines 8-9 and col. 3, lines 31-32. For example, figs. 6 and 9 respectively illustrate the DH and DH2 implementations having diagonal parity D striped across a row of storage disks d0-d6. Horizontal parity (H) in the DH arrangement is also striped across multiple disks (fig. 5), whereas horizontal parity is stored in a single disk in the DH2 arrangement (fig. 8).

The Applicants urge that Han is legally precluded from anticipating or rendering obvious the Applicants' claim 1 because of its complete absence of ***a storage array having a plurality of concatenated sub-arrays, each sub-array including a set of data storage devices and a first parity storage device*** and also because Han also fails to teach or suggest ***a global secondary storage device associated with the storage array and holding secondary parity values for the single secondary parity group, the secondary parity values computed across the concatenation of the sub-arrays.***

As noted, the Applicant's claim 1 explicitly recites *a storage array having a plurality of concatenated sub-arrays, each sub-array including a set of data storage devices and a first parity storage device*. In contrast, each of Han's DH and DH2 parity arrangements utilizes a storage-disk array that is not comprised of a plurality of concatenated sub-arrays, as claimed. See Han, figs. 5-10 and col. 2, lines 66-67 ("a disk array defined as a matrix of $(N-1)*N$ comprising N disks") and col. 3, lines 23-25 ("a disk array defined as a matrix of $(N-1)*(N+1)$ including $N+1$ disks"). In fact, there is no teaching or suggestion of segmenting a disk array in Han into a plurality of different sub-arrays, each sub-array having its own set of data storage devices and parity storage device as claimed.

The Office action suggests that each storage disk in Han is a separate sub-array, so a concatenation of Han's storage disks is allegedly equivalent to the Applicants' claimed concatenation of sub-arrays. See, e.g., Office action, page 6 ("Han discloses a plurality of concatenated sub-arrays ($N+1$ disks)"); Office action, page 3 ("a plurality of concatenated sub-arrays ($N+1$ disks)"); Office action, page 8 ("A storage array (Figures 8-10) having a plurality of concatenated sub-arrays (d0-d6), each sub-array (d0-d6) including a set of data storage devices"). The Applicants respectfully disagree with this interpretation of Han.

Each of the Applicants' claimed sub-arrays includes *a set of data storage devices and a first parity storage device*. In sharp contrast, each disk in Han is only a single data storage device. Consequently, a storage disk in Han cannot also be a sub-array having "a

set of data storage devices and a first parity device,” as explicitly claimed. Indeed, it is readily apparent that a single data storage device in Han cannot anticipate or render obvious the Applicants’ claimed sub-array including *multiple* storage devices (i.e., “a set of data storage devices and a first parity storage device”). For this reason, the Applicants respectfully submit that it is improper to equate Han’s storage disks (d0-d7) with the Applicants’ claimed sub-arrays.

In addition, because the Applicants’ claimed storage array contains a *plurality of concatenated sub-arrays* and each sub-array includes *a first parity storage device*, the Applicants’ claimed storage array necessarily contains multiple parity storage devices. Han does not teach or suggest a storage array having multiple parity storage devices. For instance, in the DH arrangement, both diagonal (D) and horizontal (H) parity are striped across multiple disks in the $(N-1)*N$ array, and thus none of the storage disks is used as a parity storage device. *See* figs. 5-7. Likewise, the DH2 arrangement also stripes diagonal parity D across multiple disks in the $(N-1)*(N+1)$ array, and only includes a single parity storage device (disk d7) for storing horizontal parity H. *See* figs. 8-10. Accordingly, neither the DH or DH2 parity arrangements employs *multiple* parity storage devices for a plurality of sub-arrays, as claimed.

Since a fair and proper reading of Han fails to teach or suggest *a storage array having a plurality of concatenated sub-arrays, each sub-array including a set of data storage devices and a first parity storage device*, Han also cannot teach or suggest *a global secondary storage device associated with the storage array and holding secon-*

dary parity values for the single secondary parity group, the secondary parity values computed across the concatenation of the sub-arrays.

Based on the foregoing, the Applicants respectfully submit that independent claim 1, in its present form, is allowable over the cited art since Han does not anticipate or render obvious the Applicants' claimed *a storage array having a plurality of concatenated sub-arrays, each sub-array including a set of data storage devices and a first parity storage device and a global secondary storage device associated with the storage array and holding secondary parity values for the single secondary parity group, the secondary parity values computed across the concatenation of the sub-arrays.*

Because independent claims 10, 24-26, 30, 45 and 58 comprise the same or similar patentable subject matter as independent claim 1, Applicants respectfully submit that these claims are also allowable for at least the same reasons. Furthermore, claims 2-9, 17-18, 27, 31-42 and 46-57 depend on allowable independent claims and are thus allowable for at least the same reasons.

At paragraph 4 of the Office action, claims 11-16, 19-23, 28, 29, 43 and 44 were allowed.

All independent claims are believed to be in condition for allowance.

All dependent claims are believed to be dependent from allowable independent claims, and therefore in condition for allowance.

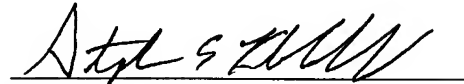
Favorable action is respectfully solicited.

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Respectfully submitted,

A handwritten signature in black ink, appearing to read "Stephen E. Kabakoff", written over a horizontal line.

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